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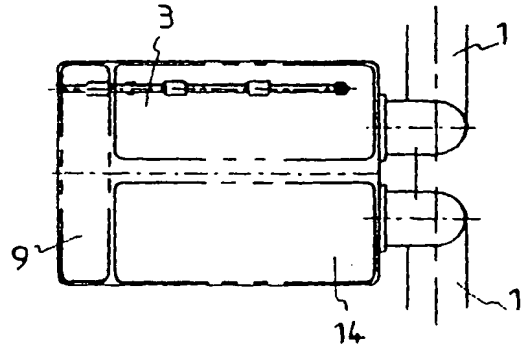
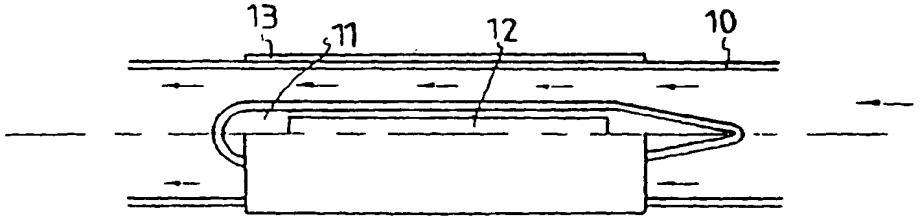
For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: A SYSTEM OF CONVERTING FUEL INTO A PLASMA STATE TO REDUCE FUEL CONSUMPTION AND POLLUTANTS





(57) Abstract: A clarifying system using the exhaust gas of an internal-combustion engine is related to a clarifying system changing the exhaust gas of an internal-combustion engine to a plasma state, so that the harmful elements in perfect combustion and in the exhaust gas induced to the perfect combustion is disposed by ozone and plasma discharge.

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A system of converting fuel into a plasma state to reduce fuel consumption and pollutants

Background of the invention

Field of the Invention

The present invention is related to a clarifying system changing the exhaust gas of an internal-combustion engine to a plasma state, so that the harmful elements in perfect combustion and in the exhaust gas induced to the perfect combustion is disposed by ozone and plasma discharge.

The internal-combustion engine of the prior arts does not have a system that treats and clarifies the exhaust gas in order to reduce the fuel consumption, and they have only one of them, reducing the fuel consumption or clarifying the exhaust gas.

Furthermore, even most apparatuses for reducing the fuel consumption cannot convert fuel into the active gaseous body, so it is not helpful for reducing the cost of fuel consumption, and the system clarifying the exhaust gas is not efficient because of the imperfect combustion.

That is to say, for the reducing method of the fuel consumption of an internal-combustion engine, at first, there is a method using magnetic force, but a magnet used for producing the magnetic force line has problems such as decreasing magnetic power in a high temperature, and bringing clog of the injector, secondly, the method using chemical catalyst is inefficient as time goes by, due to the abrasion of surface of the

catalyst and less activation, thirdly, mechanical method cannot separate the formation of molecule of fuel, and minute metal elements can be inserted into the injector or inside of a cylinder, last but not least, ECU control method does not control the whole function of car, and managing and communication with ECU of the prior automobiles.

Therefore, they reduce the fuel consumption only by providing fuel according to the speed because they do not acquire the best fuel consumption from the perfect combustion.

Accordingly, in case that the drivers ignore this term and drive without care, it is impossible to get the best fuel consumption.

Also, the exhaust gas used in this term causes to produce the harmful exhaust gas, which makes impossible to clarifying the exhaust gas completely.

For exhaust gas of the prior art, fuel ignited in the internal-combustion engine is ventilated through an exhaust pipe, a three catalyst apparatus and muffler.

In recent times, the main cause of the air pollution is changing from factories and heating system to cars, so density of sulfurous acid gas (SO_2) and dust are decreasing, while the main element of exhaust gases of cars, the density of nitrogenous oxide (NO x) and ozone (O_3) are increasing. Moreover, because a particle element is exhausted from the gasoline cars, the density of minute particles in the atmosphere is increasing, which makes the situation worse and worse.

Therefore, for the technology of decreasing exhaust gases, filter (DPF) of a particle element, oxide catalyst (DOC), DeNOx catalyst or SCR catalyst can be used by means of high-pressure jet, that is, common rail, the amount of fuel jet, or electronic adjustment of the jet time and engine improvement and disposition technology such as

recycling of the exhaust gases in order to improve the fuel, combustion room and the fuel gauge.

Nevertheless, the method of the three catalysts is not efficient enough to clarify, because catalytic poison, which is produced by no-reaction hydrocarbon or SOx, cannot be eliminated easily.

For the above reason, a method of trap muffler is applied these days, but this kind of method has some problems like that it must be changed for the present muffler and it is expensive.

Discussion of Related Art

The present invention is provided in order to solve the above problem, when the exhaust gas of high temperature flows against the fuel pipe, which flows liquid fuel, it is accelerated by the reaction core under vacuum and the fuel is to be changed from the low density status to the active gaseous body, and the liquid fuel is induced to the plasma status using a magnetic field by static electricity from a gap of temperature, so that the fuel is converted to the active gaseous body and ignited completely, and after the exhaust gases are oxidized by ozone of high-voltage and high-density, non-treated by ozone and used ozone are to be eliminated by the high-temperature plasma reaction pipe.

Summary of the Invention

When the exhaust gas of high temperature flows against the fuel pipe, which flows liquid fuel, it is accelerated by the reaction core under vacuum and the fuel is to be changed from the low density status to the active gaseous body, and the liquid fuel is induced to the plasma status using a magnetic field by static electricity from a gap of temperature, so that the fuel is converted to the active gaseous body and ignited completely, and after the first clarification by ozone, again, the perfect treatment is possible by the high-temperature plasma discharge.

Brief Description of the Attached Drawings

FIG. 1 is a state view showing the appearance of the embodiment of the present invention;

FIG. 2 is a state view of connection of the low-temperature plasma reaction pipe with the exhaust pipe of the present invention;

FIG. 3 is a state view showing the internal structure of the low-temperature plasma reaction pipe;

FIG. 4 is a state view showing arrangement of the variable pipe of the low-temperature plasma reaction pipe;

FIG. 5 is a sectional side view of the above variable pipe;

FIG. 6 is a processing view of the manufacturing method of the reaction core;

FIG. 7 is a view showing the structure of the electronic controller and solenoid valve;

FIG. 8 is a sectional view showing the structure of the high-voltage ozone

producing apparatus;

FIG. 9 is a sectional view showing the structure of the high-temperature plasma reaction pipe; and

FIG. 10 is a view of the reaction core inside of the high-temperature plasma reaction pipe.

Detailed Description of Preferred Embodiment

The following is the detailed description of the most desirable embodiment of the present invention. The most desirable embodiment of this invention will be described in detail according to the attached drawings on the following and the same reference number will be used to mean the same drawing elements regardless of different drawings.

As shown in FIG. 1, the fuel pipe (2) is installed inside of the low-temperature plasma reaction pipe (3) in order to cross the exhaust gas over fuel, and the reaction core (4), which has an incline (5) downward of the direction of fuel flowing, is formed in the said fuel pipe (2), and the exhaust gas is cross to the direction of the fuel flowing, and flow through the low-temperature plasma reaction pipe (3) at the same time, so that the exhaust gas is clarified while it is coming out from the high-voltage ozone producing apparatus (9).

At this point, the exhaust gas flows through the exhaust pipe (1) from an internal-combustion engine, and a fuel pipe (2) is fixed by a supporting board (not shown in Figure) inside of the low-temperature plasma reaction pipe (3), which flows

the exhaust gas.

Furthermore, the reaction core (4) is formed inside of the fuel of the fuel pipe (2), and this the reaction core (4) is transformed as the active gaseous body in the changing condition from a vacuum status to the low density status by acceleration and maintains the status as sublimate gaseous molecule status by increasing the volume on the basis of the start point of the partial ignition, which is occurred at the climax (a) due to the acceleration of the conflict between fluids.

When the fuel of the fuel pipe (2), which is across with the waste gas flowing through the low-temperature plasma reaction pipe (3), is transformed as the active gaseous body in the changing condition from a vacuum status to the low density status by acceleration, the incline (5) of the reaction core (4) maintains the status as sublimate gaseous molecule status by increasing the volume on the basis of the start point of the partial ignition, which is occurred at the climax due to the acceleration of the conflict between fluids.

For this, the mark line (19) is made at the start point of the partial ignition when the fuel is across with the waste gas, and the mark line (19) has sills (20) at a regular depth, which is connected to each other, so that the incline (5) can be made.

At this point, each sill can be used as it is, but in this case, fuel cannot be provided exactly, because a state of flux of the sublimate gaseous molecule is changed irregularly.

Moreover, fuel can be adjusted in order to be transferred to the active gaseous body by means that the thickness of the fuel pipe (2) is to be made different according to the volatility of fuel and according to the length of the low-temperature plasma

reaction pipe (3).

The said low-temperature plasma variable pipe (8), which assembles each fuel pipe (2) is formed inside of the low-temperature plasma reaction pipe (3), so that the fuel can be injected through the fuel exit (18) that is formed each variable pipe (8) according to the output status of the engine in the low-temperature plasma reaction pipe, this injection is adjusted by the solenoid valve (7) using the electronic controller.

Thus, the evaporation of fuel starts at the direction of fuel flowing as the first level according to inducing of vacuum status of the inhaling valve and the energy is produced when it is across the fuel, and then the density of liquid fuel is changed into a variable density in a state mixed gaseous body and as the second level, the gap between formation of molecule should be as large as possible in order that the variable density of fuel may convert to lower density, so that the passage part (b), which has the inside diameter by the reaction core (4) gaseous state of the low-density in response to the variable of acceleration, as the third level, a producing condition for the electronic field at the direction of the natural magnetic field is induced using the difference between the high-temperature of the exhaust gas and the low-temperature of the fuel, so that the fuel molecule is given the condition for the polar inducement in order to be ionized producing the plasma, and as the forth level, transformation of the formation of fuel molecule, which is polar-induced by the high-voltage static electricity produced at the border facet producing the cross-heat between the high-temperature and the low-temperature, is generally performed at the direction of fuel flowing by the low-temperature plasma heat-reversible reaction, and finally, as the fifth level, the partial discharge is processed by the low-temperature plasma and only when this state is kept

the formation of fuel molecule transformed as the state of the low-temperature plasma can be maintained by decreasing the density of atmosphere using vacuum at the producing point the low-temperature plasma of the reaction core in order to provide fuel that has ionized polarity to the cylinder.

If this producing point of reaction core is not regular, ignition from outside can be made instead the perfect combustion is produced inside of the cylinder due to excess the partial combustion.

Also, when each activated gaseous molecule is exhausted from the low-temperature plasma variable pipe (8) through the fuel exit (18) according to each of the variable density, fuel is provided appropriate to the variable density, and this provision is performed by the solenoid valve (7) of the electronic controller (6).

Therefore, the perfect combustion can be made by the active gaseous body because of the provision of fuel in the most appropriate condition, which is provided from the low-temperature plasma variable pipe (8) through the fuel exit (18) according to each operating situation of requisition of the number of turning in the high and low speed or low speed.

At this point, the exhaust gas flows through the exhaust pipe (1) from an internal-combustion engine, and a fuel pipe (2) is fixed by a supporting board (not shown in Figures) inside of the low-temperature plasma reaction pipe (3), which flows the exhaust gas.

Furthermore, the reaction core (4) is formed inside of the fuel of the fuel pipe (2), and this the reaction core (4) is transformed as the active gaseous body in the changing condition from a vacuum status to the low density status by acceleration and

maintains the status as sublimate gaseous molecule status by increasing the volume caused from the incline (5), which is occurred at the climax (a) due to the acceleration of the conflict between fluids.

When the fuel of the fuel pipe (2), which is across with the waste gas flowing through the low-temperature plasma reaction pipe (3), is transformed as the active gaseous body in the changing condition from a vacuum status to the low density status by acceleration, the incline (5) of the reaction core (4) maintains the status as sublimate gaseous molecule status by increasing the volume on the basis of the start point of the partial ignition, which is occurred at the climax due to the acceleration of the conflict between fluids.

For this, the mark line (19) is made at the start point of the partial ignition when the fuel is across with the waste gas, and the mark line (19) has sills (20) at a regular depth, which is connected to each other, so that the incline (5) can be made.

At this point, each sill can be used as it is, but in this case, fuel cannot be provided exactly, because a state of flux of the sublimate gaseous molecule is changed irregularly.

Moreover, fuel can be adjusted in order to be transferred to the active gaseous body by means that the thickness of the fuel pipe (2) is to be made different according to the volatility of fuel and according to the length of the low-temperature plasma reaction pipe (3).

The said low-temperature plasma variable pipe (8), which assembles each fuel pipe (2) is formed inside of the low-temperature plasma reaction pipe (3), so that the fuel can be injected through the fuel exit (18) that is formed each variable pipe (8)

according to the output status of the engine in the low-temperature plasma reaction pipe, this injection is adjusted by the solenoid valve (7) using the electronic controller.

Thus, the evaporation of fuel starts at the direction of fuel flowing as the first level according to inducing of vacuum status of the inhaling valve and the energy is produced when it is across the fuel, and then the density of liquid fuel is changed into a variable density in a state mixed gaseous body and as the second level, the gap between formation of molecule should be as large as possible in order that the variable density of fuel may convert to lower density, so that the passage part (b), which has the inside diameter by the reaction core (4) gaseous state of the low-density in response to the variable of acceleration, as the third level, a producing condition for the electronic field at the direction of the natural magnetic field is induced using the difference between the high-temperature of the exhaust gas and the low-temperature of the fuel, so that the fuel molecule is given the condition for the polar inducement in order to be ionized producing the plasma, and as the forth level, transformation of the formation of fuel molecule, which is polar-induced by the high-voltage static electricity produced at the border facet producing the cross-heat between the high-temperature and the low-temperature, is generally performed at the direction of fuel flowing by the low-temperature plasma heat-reversible reaction, and finally, as the fifth level, the partial discharge is processed by the low-temperature plasma and only when this state is kept the formation of fuel molecule transformed as the state of the low-temperature plasma can be maintained by decreasing the density of atmosphere using vacuum at the producing point the low-temperature plasma of the reaction core in order to provide fuel that has ionized polarity to the cylinder.

If this producing point of reaction core is not regular, ignition from outside can be made instead the perfect combustion is produced inside of the cylinder due to excess the partial combustion.

Also, when each activated gaseous molecule is exhausted from the low-temperature plasma variable pipe (8) through the fuel exit (18) according to each of the variable density, fuel is provided appropriate to the variable density, and this provision is performed by the solenoid valve (7) of the electronic controller (6).

Therefore, the perfect combustion can be made by the active gaseous body because of the provision of fuel in the most appropriate condition, which is provided from the low-temperature plasma variable pipe (8) through the fuel exit (18) according to each operating situation of requisition of the number of turning in the high and low speed or low speed.

At this point, for the structure of the high-voltage ozone producing apparatus (9), the exhaust gas is flowing inside of the external discharge tube (13), which is formed the discharge pole plate (10), and the internal discharge tube (11), which is formed the discharge coil (12), is fixed at the backward part.

Furthermore, for the structure of the high-temperature plasma reaction pipe (14), a few of exhaust pipes (1) are installed inside of the reaction pipe (14), and the piling barrel (15), which induces the flux of gas, and the exhaust barrel (16) is formed at the two side of the forward part of the exhaust pipe (1), and the reaction core (17) is formed inside of the exhaust pipe (1) at the same direction with the flux of the exhaust gas.

Therefore, the external discharge tube (10) and the internal discharge tube (11) of the high-voltage ozone producing apparatus (9) are separated, and the high-pressure

conducting wire is waterproofed and heat-proofed, so that the exhaust gas is not ignited by the high-pressure voltage, moreover, the pipe, that oxygen passes, is closed up and is designed to flow between the discharge production facets, which produces the discharge of electricity.

Furthermore, the exhaust gas produced from the high-pressure is separated by the high-pressure discharge of 20,000-volt, which is produced between the discharge coil (12) and the discharge pole plate (13), and combined with ozone, which is produced in a high density, so that it induces the corrosion and the harmful elements of the exhaust gas are forced to be oxide.

Also, the high-temperature plasma reaction pipe (14) is installed connected to the circular pipe, which is parallel in a mutual-adjusting interval, by the high-temperature plasma reaction in order to eliminate oxidized exhaust gas treated by ozone, not removed harmful elements and used ozone, and the length of the reaction pipe is to be installed adding up the extended range by repeated experiments.

The reaction core (17) of the high-temperature plasma reaction pipe (14) prevents the rapid combustion over the producing point, and instant producing heat is about 10 thousand degree, which is enough for the condition of the high-temperature plasma to eliminate the residual harmful gas, so appropriate textiles, which can bear up against heat should be used according to the eliminating amount.

Moreover, the length of the reaction core is to be adjusted properly in order to adjust appropriate temperature of the exhaust gas for keeping the temperature suitable to the three catalyst apparatus of the prior art.

What is claimed is:

1. A clarifying system using the exhaust gas of an internal-combustion engine wherein comprising;

a fuel pipe (2), which is installed inside of the low-temperature plasma reaction pipe (3) in order to cross the exhaust gas over fuel,

a reaction core (4), which has an incline (5) downward of the direction of fuel flowing, is formed in the said fuel pipe (2), and the exhaust gas is cross to the direction of the fuel flowing, and flow through the low-temperature plasma reaction pipe (3) at the same time, so that the exhaust gas is clarified while it is coming out from the high-voltage ozone producing apparatus (9).

2. A clarifying system using the exhaust gas of an internal-combustion engine as claimed in claim 1 wherein; the reaction core (4) has an incline (5) downward of the direction of fuel flowing.

3. A clarifying system using the exhaust gas of an internal-combustion engine as claimed in claim 1 wherein; the plasma variable pipe (8), which assembles each fuel pipe (2) is formed inside of the low-temperature plasma reaction pipe (3), so that the fuel can be injected through the fuel exit (18) that is formed each variable pipe (8) according to the output status of the engine in the low-temperature plasma reaction pipe,

4. A clarifying system using the exhaust gas of an internal-combustion engine as claimed in claim 1 wherein; the high-voltage ozone producing apparatus (9) has the

external discharge tube (13), of which is the exhaust gas is flowing inside and is formed the discharge pole plate (10), and the internal discharge tube (11), which is formed the discharge coil (12), is fixed at the backward part.

5. A clarifying system using the exhaust gas of an internal-combustion engine as claimed in claim 1 wherein; for the structure of the high-temperature plasma reaction pipe (14), a few of exhaust pipes (1) are installed inside of the reaction pipe (14), and the piling barrel (15), which induces the flux of gas, and the exhaust barrel (16) is formed at the two side of the forward part of the exhaust pipe (1), and the reaction core (17) is formed inside of the exhaust pipe (1) at the same direction with the flux of the exhaust gas.

6. A clarifying system using the exhaust gas of an internal-combustion engine as claimed in claim 1 wherein; the mark line (19) is made at the start point of the partial ignition when the fuel is across with the waste gas, and the mark line (19) has sills (20) at a regular depth, which is connected to each other, so that the incline (5) can be made.

7. A clarifying system using the exhaust gas of an internal-combustion engine as claimed in claim 3 wherein; the injection is performed by the solenoid valve (7) of the electronic controller (6).

8. A clarifying system using the exhaust gas of an internal-combustion engine as claimed in claim 5 wherein; the reaction core (4) has an incline (5) downward of the direction of fuel flowing.

Fig. 1

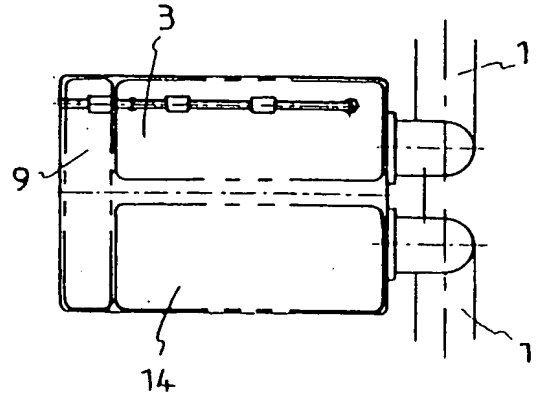
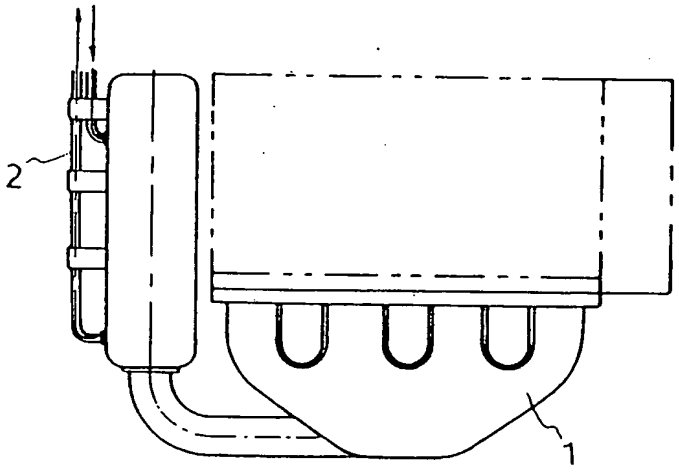


Fig. 2



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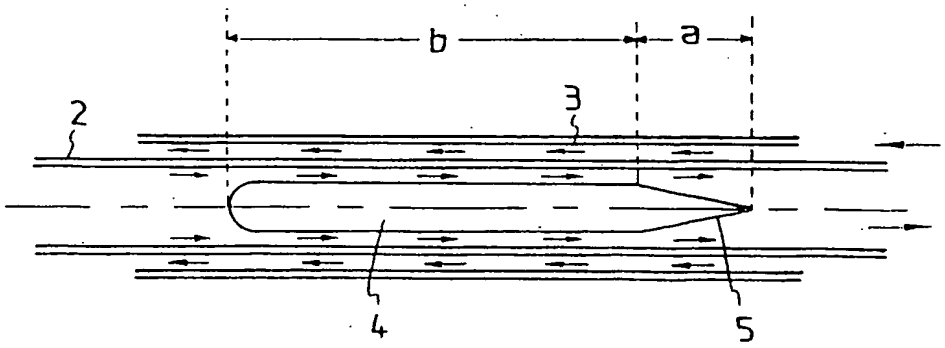


Fig. 4

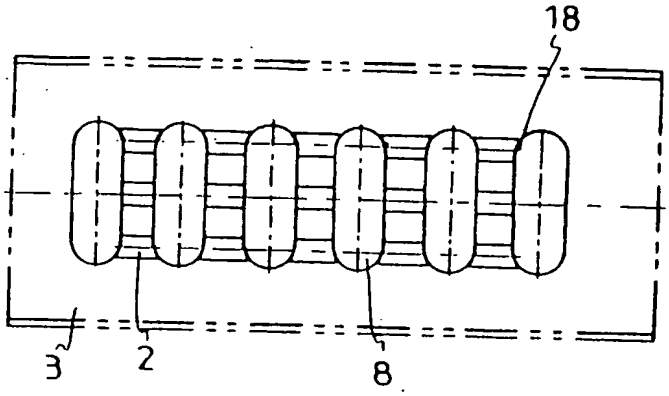


Fig. 5

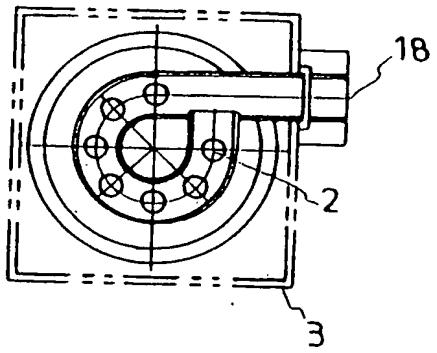


Fig. 6

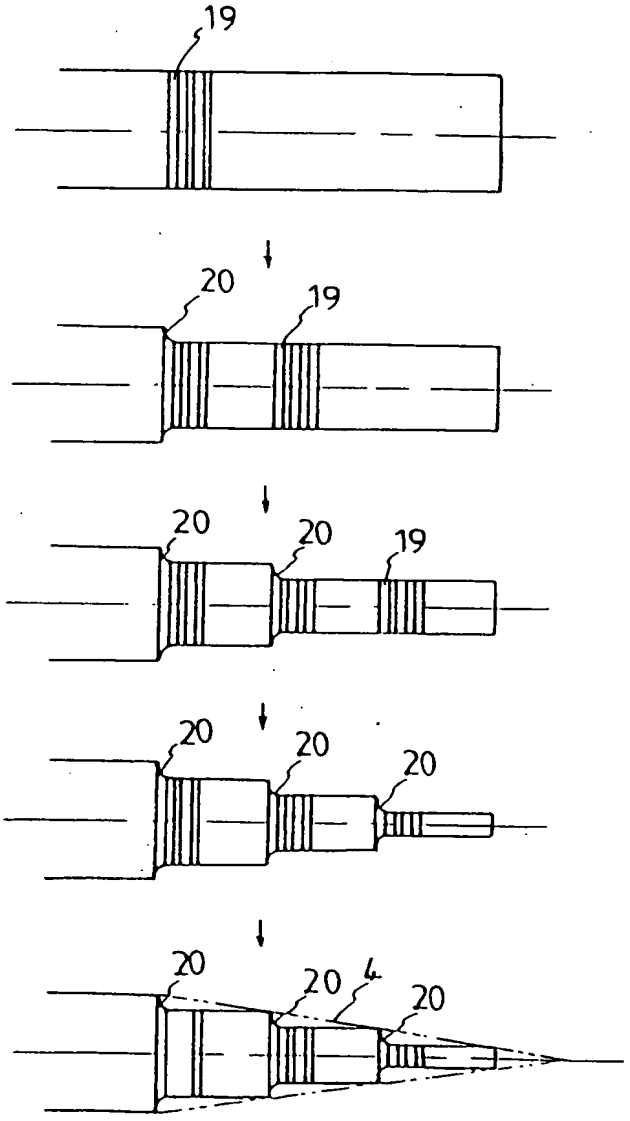


Fig. 7

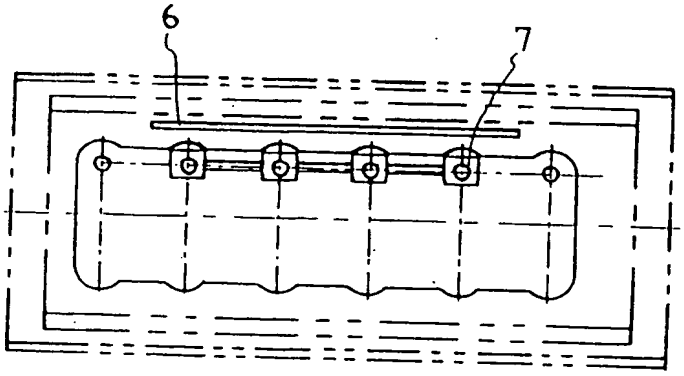


Fig. 8

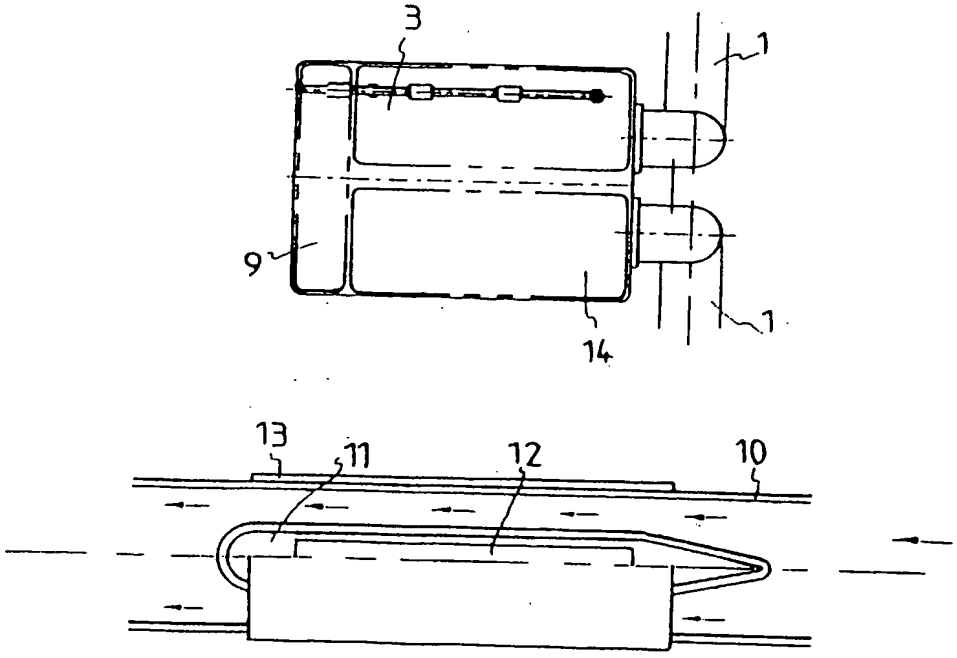


Fig. 9

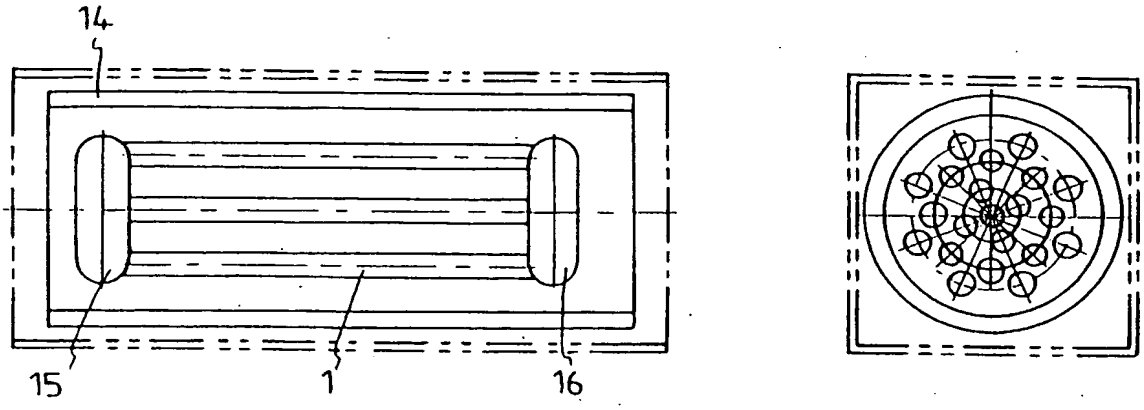
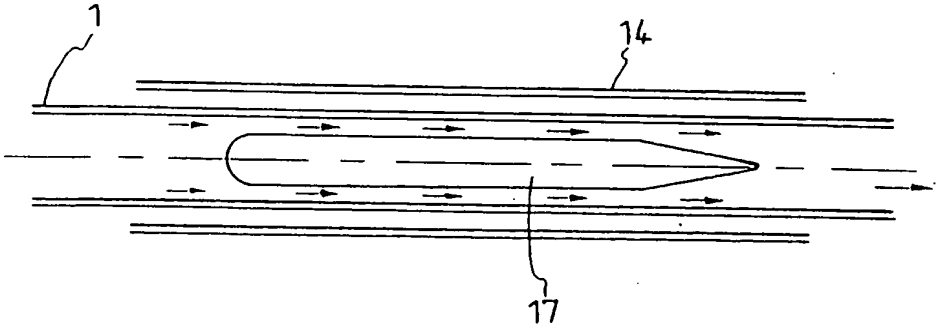


Fig. 10



INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR01/00186

A. CLASSIFICATION OF SUBJECT MATTER

IPC7 F02M 31/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimun documentation searched (classification system followed by classification symbols)

IPC7 F02M

Documentation searched other than minimun documentation to the extent that such documents are included in the fileds searched

Korean Patents and applications for inventions since 1947. Korean Utility models and applications for Utility models since 1947. Japanese Utility models and application for Utility models since 1974.

Electronic data base consulted during the internationl search (name of data base and, where practicable, search trerms used)

NPS
"fuel", "exhaust", "gas", "plasma", "reaction", "core", "ozone", "electronic", "discharge".

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP6-346807A(AQUEOUS RES. KK) 20 DECEMBER 1994 See entire document.	1
A	JP58-18548A(TOKYO TATSUNO LTD.) 3 FEBRUARY 1983 See entire document.	1
A	JP57-46059A(SUMITOMO HEAVY IND. LTD.) 16 MARCH 1982 See entire document.	1
A	JP60-75752A(MITSUBISHI ELECTRIC CORP.) 30 APRIL 1985 See entire document.	1
A	JP57-105486A(YAMASHITA TOSHIHARU) 30 JUNE 1982 See entire document.	1, 4

☐ Further documents are listed in the continuation of Box C.

☐ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevence
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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
25 SEPTEMBER 2001 (25.09.2001)	27 SEPTEMBER 2001 (27.09.2001)

Name and mailing address of the ISA/KR	Authorized officer
Korean Intellectual Property Office Government Complex-Daejeon, Dunsan-dong, Seo-gu, Daejeon Metropolitan City 302-701, Republic of Korea Facsimile No. 82-42-472-7140	SOHN, Sung Ho Telephone No. 82-42-481-5477

Form PCT/ISA/210 (second sheet) (July 1998)